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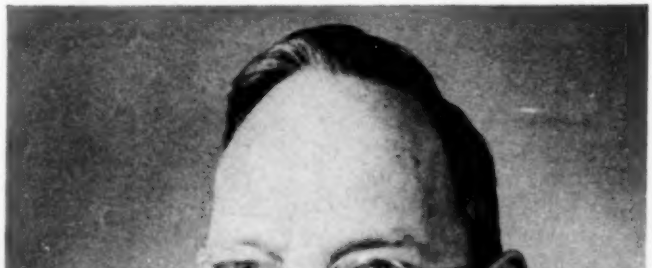

CHESTER A. AMICK, F.A.I.C.

Active in New Jersey Chapter

(See pages 275 and 277)

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SCHEDULED FOR EARLY ISSUES

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IN THIS ISSUE

(Departments omitted or curtailed in this issue, for lack of space, will be restored in later issues.)

Cover Picture

Chester A. Amick, the immediate past chairman of the New Jersey Chapter of THE AMERICAN INSTITUTE OF CHEMISTS, is the technical patent assistant to the director of application research of the Calco Chemical Division of the American Cyanamid Company at Bound Brook, N.J.

He was born in Indiana, graduated from Indiana University in 1920, received the Master's degree in 1921, and did graduate work with Professor W. D. Bancroft at Cornell in 1925-1927. After high school, but before college, he taught a one-room rural high school covering ten subjects each day.

He served with the Indiana National Guard on the Mexican border in 1916 and with the A.E.F. in France and Germany in 1918 and 1919, following which he was detailed to the University of Lyons, France, as a soldier-student for four months.

Following his work at Cornell, Mr. Amick spent eight years as research chemist at Pacific Mills, as director of research at the United States Finishing Company, and as director of research and superintendent of finishing of resin-treated fabrics at the Glenlyon Print Works of the Sales Finishing Company, where he finished the first yard of cotton fabric to receive a crease-resistant finish in the United States.

In 1935, he came to Calco where his work in the application of colors to textiles and the finishing of textile fabrics has resulted in twenty-five United States and forty foreign patents.

He is a member of the American Association of Textile Chemists and Colorists, the Society of Dyers and Colorists (England), American Chemical Society, Theta Chi, Alpha Chi Sigma, and Phi Beta Kappa. He served as counselor and alternate of the American Chemical Society for four years and is an elder in the Presbyterian Church. He has been enthusiastically active in the New Jersey AIC Chapter for several years, where he contributes greatly to its success.

EDITORIAL

Our Responsibility

Chester A. Amick, F.A.I.C.

Calco Chemical Division, American Cyanamid Company, Bound Brook, N.J.

A FEW years ago, an editor friend asked us to write for him an article on "How Chemists Succeed." His request was relayed to three chemist friends for trial suggestions. Much to our chagrin, the answer was unanimous, "The best way to succeed is to be at the right place at the right time."

It is hard to believe that experienced adults are willing to travel through life with the basic belief that what success one may have is the result of chance. It would appear to be much better, if a self-directed campaign of sound education, hard work, and professional spirit were used as a basis for success.

What is professional spirit? The ability to cooperate with your superior, your co-worker, your neighbor, and your associates. While these items may not speed one to the top, they certainly will keep one from dragging the bottom. The importance of professional spirit was emphasized recently in an editorial in *Chemical & Engineering News,* November, 1950, which stated that a Harvard survey of four-thousand case histories of job failures indicated that thirty-four per cent of these occurred because of inadequate technical qualifications and sixty-six per cent occurred because the individual could not get along with other people.

The INSTITUTE provides a valuable service to the chemists of the United States in emphasizing the professional angle. Not only are we fortunate that the INSTITUTE thinks in such terms, but it is our responsibility to point out to the young chemist coming from college, who expects to make chemistry his profession, that the INSTITUTE may be able to help him in his life work. Certainly, an understanding of the problems that are to be met should reduce the number of "case histories" of failures due to inability to get along with people.

Workshop in Glass Blowing: At New Mexico Highlands University, August 6th to 11th. Mr. Roensch, chief glassblower of the Los Alamos Scientific Laboratories will be in charge. Information may be obtained from Dr. H. E. Ungnade, F.A.I.C., at the university, Las Vegas, New Mexico.

AIC Friendship Dinner

THE AMERICAN INSTITUTE OF CHEMISTS will hold a "Friendship Dinner" during the International Chemical Conclave in New York, N.Y., on Tuesday, September 11, 1951, at 7:00 p.m., in the Hotel Commodore.

AIC members from all parts of the United States will meet here to make or renew friendships with other AIC members and to get acquainted with the national officers. Wives and families of members are welcome. Members of The Chemical Institute of Canada and of the Royal Institute of Chemistry will also join us at this dinner, and the presidents of these societies will extend greetings.

Please send in your reservations now to C. S. Kimball, vice president, Foster D. Snell, Inc., 29 W. 15th Street, New York, N.Y.

Honored: Dr. James R. Withrow, Hon. AIC, who was elected one of two Honorary Members of The Engineers Club of Columbus, Ohio. He has been a member since 1919 and past president (1921-1922). For several years he was a member of the American Engineering Council. He is now Emeritus Professor and former chairman of chemical engineering at Ohio State University.

International Chemical Conclave, New York, N.Y.

American Chemical Society, 75th Anniversary, September 3rd to 7th.

XVIth Conference of the International Union of Pure and Applied Chemistry, September 8th to 9th.

XIIth International Congress of Pure and Applied Chemistry, September 10th to 13th.

World Conference of Executive Secretaries of Chemical Societies, Hotel Statler, New York, N.Y. 6:30 p.m., September 10th.

"Friendship Dinner" of THE AMERICAN INSTITUTE OF CHEMISTS Hotel Commodore, New York, N.Y., 7 p.m. September 11th.

New Appointments: By Mellon Institute of Industrial Research, Pittsburgh, Pa., Dr. Edward R. Weidlein, Hon. AIC, as president and chairman of the Board; E. Ward Tillotson, Dr. William A. Hamor, F.A.I.C., George D. Beal, Leonard H. Cretcher, and Dr. George H. Young, F.A.I.C., as directors of research; and Dr. John R. Bowman, F.A.I.C., as member of the Executive Staff. As in the past, when he was director, Dr. Weidlein continues to be the chief executive officer of the corporation in charge of the active management of its affairs.

Ethics and Evolution

Jerome Alexander, Hon. A.I.C.

Consultant, 50 East 41st Street, New York, N. Y.

(Presented at the AIC Annual Meeting, May 11, 1951, as part of the Symposium on "Responsibilities of the Chemist in a Changing World.")

THE word "evolution" first brings to mind the results of the biological process termed by Charles Darwin "natural selection" and by Herbert Spencer, "the survival of the fittest". We have ample evidence in both the plant and animal kingdoms that among the endless heritable physical and chemical variations continually emerging in living things, only those lines tend to survive which pass on to descendants superior ability to cope with the ever-changing surrounding conditions. The simpler the form of life, in the case of animals, the more rigidly this rule tends to apply. I say "tends to," because as animals become more and more complex, there developed in them from practically imperceptible beginnings what we can recognize as sensitivity, consciousness, power of choice, mind, reason and soul. The fact that a material framework of enormous molecular complexity underlies and seems essential to these mental developments, in no way detracts from the reality of their existence, even though we do not understand how or why physicochemical changes become psychical facts.

In writing to his co-discoverer of natural selection, Alfred Russel Wallace, Darwin said: "The struggles between races of men depend entirely on intellectual and moral qualities". Professor Edwin Grant Conklin in quoting this statement, commented as follows: "Man is not only a biological animal but also an intellectual and social being, and the standards of fitness differ in these three aspects. Biologically the fittest are the most capable of living and leaving offspring; intellectually the fittest are the most rational; socially the fittest are the most ethical. To attempt to measure mental or social fitness by standards of biological fitness is to confuse hopelessly the whole matter and to fail utterly to recognize that human evolution has progressed in these three directions. Man owes his unique position in nature to this threefold evolution, and while the elimination of the unfit is the guiding factor in each of these three lines, the means of elimination and the goals are wholly different".

The necessity of considering the factor of mind in connection with evolution was well recognized by Darwin's contemporaries. The accom-

TABLE SHOWING PROGRESSIVE DEVELOPMENT OF MENTALITY IN ANIMALS

(After G. J. ROMANES)

Observable Phenomena	*Animal Series*	*Corresponding Stage of Human Development*
Protoplasmic movements	Protoplasmic organisms	Ovum and sperm
Non-nervous adjustments	Unicellular organisms	
Partly nervous adjustments	Extinct Coelenterata (?)	Embryo
Nervous adjustments	Coelenterata	Birth
Pleasure and pain		
Memory	Echinodermata	1 week
Primary instincts	Insect larvae Annelida	3 weeks
Association by contiguity	Mollusca	7 weeks
Recognition of offspring	Insects and Spiders	10 weeks
Secondary instincts		
Association by similarity	Fish and Batrachia	12 weeks
Reason	Higher Crustacea	14 weeks
Recognition of persons	Reptiles and Cephalopods	4th month
Communication of ideas	Hymenoptera	5th month
Recognition of pictures	Birds	8th month
Understanding of words		
Dreaming		
Understanding of mechanisms	Carnivora, Rodents, Ruminants	10th month
Use of tools	Monkeys, Cat, Elephant	12th month
Indefinite morality	Anthropoid Apes and Dog	15th month

panying Table is epitomized from "Mental Evolution in Animals" by George J. Romanes (London, 1885), a book containing a posthumous essay on "Instinct" by Darwin himself. The Table shows serially, though quite roughly, (1) the observable evidences of mental or intellectual development; (2) the animals which exhibit this evidence; (3) the corresponding age at which the developing human being objectively supplies evidence of corresponding mentality.

The conflict between scientific inquiry and theological dogmatism was even then developing, Darwin and his followers believing that the mind of man has been slowly evolved from lower types of psychical existence, while Wallace and his followers held the human mind was not so evolved and stands apart, *sui generis*, from all other types of such existence. Dr. Romanes also observed that by cautious use of deductive reasoning considerable advances had been made in the science of psychology, where inability to make critical experiments had prevented inductive reasoning. A recent review dealing with some aspects of these problems is found in "The Biological Basis of Individuality" (1947) by Professor Leo Loeb.

All knowledge, even if sanctified by the adjective "scientific", should have subscribed to its statements the abbreviation formerly added by cautious accountants to their reports—E.

and O.E. (errors and omissions excepted). Thus our sacred *atom* (from the Greek *a,* privative, *temno,* to cut) has within the lifetime of most of us been literally *atomized,* and we are now attacking atomic nuclei and even subnuclear particles. The persistence of scientific fundamentalism extends even into our present nomenclature. Thus when experimenters of recognized ability are unable to find a synthetic medium in which to grow e.g., a virus, which grows and reproduces within some other living unit, they dub it an "obligate parasite", an expression carrying the connotation that no one can possibly do what these brilliant men have failed to do. However, Edward G. Acheson, the distinguished electro chemist, once remarked: "It is often the poor fool that does not know any better who does the thing that can't be done. You see, the poor fool does not know that it can't be done—so he goes ahead and does it".

In last analysis no scientist ever creates any basic material unit. All we can do is to change the positions of some material units and try to observe the consequences. A most important factor in our investigations is, however, the mental ability to plan and assemble apparatus and to draw reliable conclusions from the observable results. Cybernetics gives a faint notion of the tremendous complexity of the biological mechanisms which underlie our mental processes; but despite clever language we still do not know how these complex physicochemical changes become consciousness, thought and reason. And to say that these changes *are* their accompaning mental consequences does not solve the baffling problem, even if we are ashamed to admit there are facts we can't understand. The emergence, development and utilization of superior mental faculties have enabled man, with increasing success and at chosen times and places, to control natural forces and thus to direct somewhat to his own choice the ordinary course of nature. What are commonly recognized as the finer things in human life and society, including ethics, are outgrowths from human mentality. As Hamlet remarked: "There is nothing either good or bad, but thinking makes it so". All human society, laws and ethics are aftermaths of human thought and reason.

It is not easy to say where in the evolution of mind definitely human mentality emerged. Many animals exhibit traits and behaviors which we regard as estimable in human beings, and thus adumbrate what we call personality, character and soul. The faithfulness of some of our animal friends goes far beyond the bounds of their own self-interest. The following was written at the request of a doglover who was compiling a book of quotations about dogs.

DOGGEREL

Dogs in shape and size are various;
Colors, markings multifarious
Legs—they run from Dachs to Grey-
hound;
Ears—from pointed Spitz to Bay-
hound;
Hair—from Mexican to Newfound-
land,
Shaggier than all in hound-land.
Some are friendly—Collie, Setter;
Some forbidding, need a fetter
Like the Mastiff or Great Dane.
Pugs are stupid; Poms are vain;
Pointers point; Retrievers fetch;
Terriers frisk; and Bulldogs catch.
Dogs may growl, whine, yelp till
noon,
Woof, bow-wow, or bay the moon.
Rats and cats they chase and rend.
But they're Man's most faithful
friend.
There are few things, as we see,
That Dogs can not do—or be;
Showing every human trait
Except ingratitude and hate.

One of the earliest manifestations of the cleavage between human and brute mentality is care for the dead, apparently a development of love and affection, leading to the desire to retain the loved ones as long as possible and to rejoin them somehow and somewhere. Such thoughts naturally lead to hope of and faith in a future life of some kind, under the control of a beneficent superhuman power. Religion is based on this basic faith, even though most people confuse real religion with the many different kinds of religious dogmas and rituals based upon it by divergent theologies. Attacks directed against "religion" are essentially attacks on some or all of the various theological outgrowths of real religion, even though these theologies are meant to help their devotees to lead useful, considerate and ethical lives which is just what the "liberals" claim that they want. There is never any real conflict between science and religion, but rather a conflict for power, in which the basic concepts of religion suffer. If the contestants, instead of stressing their differences, would concentrate upon the basic faith which, like hope, "springs eternal in the human breast," the cause for this conflict would disappear. According to Ruffhead, since some passages in Pope's "Essay on Man" were criticized by theologically minded persons, the poet wrote "The Universal Prayer—Deo. Opt. Max" "which was intended to show that his system was founded in Free-will and terminated in Piety." I give but the first stanza of this sincere outpouring:

Father of all! in every age,
In ev'ry clime adored,
By saint, by savage, and by sage,
Jehovah, Jove, or Lord!

Philosophy indicates that the ultimates of both mind and matter are beyond human comprehension. This has been jocularly expressed by the circuity: "What is matter?—Never mind. What is mind?—No matter. What is spirit?—It is immaterial". Yet despite what people may say or formally profess, the daily life of everyone demonstrates unquestionable belief in the existence of both mind and matter. We have faith in their reality and in their use, and act accordingly.

The Development of Ethical Concepts

It is impossible here to attempt to epitomize the development of ethical concepts. Moses was educated by the Egyptian priesthood, and it is illuminating to note the parallelism between some of the Ten Commandments and some of the statements in the so-called "Chapter of the Negative Confession" in the Egyptian "Book of the Dead", current in Egypt over a thousand years before the time of Moses, apparently based on concepts brought into Egypt from the East even before the First Dynasty. For example, among the forty-two negative statements supposed to be made successively to each of the forty-two Underworld Judges, No. 5 is: "I have not slain man or woman", which corresponds to the Commandment: "Thou shalt not kill". No. 19 is: "I have not defiled the wife of a man", which corresponds to the Commandment: "Thou shalt not commit adultery". The Commandment: "Thou shalt not steal" sums up no less than seven of the Egyptian disclaimers: No. 2, "I have not robbed with violence"; No. 4, "I have not committed theft"; No. 6 "I have not made light the bushel"; No. 8, "I have not purloined the things which belong unto God"; No. 10, "I have not carried away food"; No. 13, "I have not killed the beasts (which are the property of God); No. 41, "I have not increased my wealth, except with such things as are (justly) mine own possessions". Apparently at that time no one word satisfactorily covered all these forms of stealing. Egyptian contracts often had nine or more witnesses.

It may also be recalled that the Egyptian priest-scientists matched the miracles of Moses and Aaron in turning their rods into serpents, in turning the river waters to blood, and in bringing up frogs upon the land of Egypt; but Exodus VIII, 18, states: "And the magicians did so with their enchantments to bring forth lice, but they could not". And they could not follow Moses and Aaron in the further demonstrations, among which is one that seems to me to be the earliest description of biological warfare and possibly evidence of immunization antedating Pasteur; for not only did the cattle of the Israelites escape the grievous murrain, but both men and beasts escaped infection when (Exodus IX, 10) "they took ashes of the furnace, and stood before Pharaoh; and Moses sprinkled it up towards heaven; and it became a boil breaking forth with blains upon man and upon beast. (11) And the magicians could not stand before Moses because of the boils; for the boil was upon the magicians, and upon all the Egyptians". Immunization practices existed in Africa from time immemorial, without theoretical knowledge. The "ashes of the

furnace" might well have been a bacterial culture.

Mistranslation of the Bible has caused some misunderstandings. In St. Jerome's Latin version known as the Vulgate, used throughout the Middle Ages, it was stated that when Moses came down from Mt. Sinai he had horns on his head. The Greek version, known as Septuagint because it was made by seventy Hebrew scholars, was free from this error which apparently entered because St. Jerome had translated the Hebrew word *keren* literally, whereas in the text it was used as a denominative verb meaning to jut or radiate outward like a horn. Our colloquial expression "to horn in" gives an analogous though reversed picture. The real meaning was that the face of Moses shone or was radiant, because he had been in the presence of God. However, in the famous marble now in the Church of San Pietro in Vinculi in Rome, Michelangelo put short horns on Moses; and Rembrandt in his painting of Moses discreetly hid the horns in whisps of hair.

Ethics in Science

Considering the development of ethics in the experimental sciences, chemistry and physics, we find very high ethical standards, which also obtain in their various derivative sciences and professions, e.g., biological chemistry, experimental biology, medicine, and engineering. The work of experimentalists is subject to repeated checks and improvements by impartial colleagues, though in controversial matters we sometimes find what Longfellow described as "the strife for triumph more than truth". Nevertheless, the truth eventually wins out. As Galileo said: "E pur si muove!" In chemistry, no "authority" can make a reaction go as it says; and the collapse of a structure under conditions reasonably to be expected, is evidence of imperfect engineering or defective work. In the medical profession, by a curious perversion of the term, an "ethical" remedy has come to mean not necessarily one that will help the patient, but rather one obtainable only by prescription of the physician. On the other hand the consideration of most physicians for impecunious patients is an outstanding glory of their great profession.

The ethical quality of any profession is determined at any time by the individual ethics of its actual practitioners, and we chemists and engineers insist on very high standards. In an address before the Society of Medical Jurisprudence, the late Benjamin N. Cardozo pointed out that the ideals of the law stand far above the behavior of some lawyers. It must not be forgotten that, apart from technical details, all professions have human contacts, obligations and responsibilities, and that in some cases, as Robert Burns put it in his keen satire on sanctimonious hypocrites,

"vile self gets in". Let us ever keep before us the high ideals of our profession, and by both precept and example help all to continue to live up to these ideals, faithfully serving our country, our fellow citizens, and our individual clients, with proper consideration for fellow members of our own and of other professions. Such is the aim of THE AMERICAN INSTITUTE OF CHEMISTS.

The Responsibility of the Chemist to His Profession

Dr. Harry L. Fisher, Hon. AIC.

National Research Council, Washington, D.C.

(Presented at the AIC Annual Meeting, May 11, 1951, as part of the symposium on "Responsibilities of the Chemist in a Changing World.")

WHEN I was taking "English I" in college, the class was asked to write a theme on the subject, "The Kind of Novel I Like Best." I put mine in one sentence, but later received my paper back from the professor with a brief remark, "Enlarge on it." For my subject here, I could put my thought in one sentence also, "a chemist should do his job to the best of his ability." That is a chemist's responsibility to his profession. But I know you will say, "Enlarge." Therefore, I will see what I can do.

Chemists like other professional men have found it desirable to draw up a set of Rules of Conduct generally known as a Code of Ethics. This was done years ago by THE AMERICAN INSTITUTE OF CHEMISTS. This code outlines the chemist's responsibilities. In it he will find some preaching; in fact it is difficult to discuss this subject without doing a little preaching.

A chemist can be a professional man no matter what is the field or division in which he is engaged. It is what he does and how he does it that gives him his professional standing.

When a young man decides he would like to be a chemist, he studies chemistry. Sometimes the process seems to be in reverse. In my own case, chemistry literally studied me and it took me into its arms. I thought I wanted to be an editorial writer, but "English I" ended that ambition. Then I wanted to be a mathematician and a biologist, but when I took the course in organic chemistry by Prof. Mears, at Williams, organic chemistry took such a strong hold of me that I could not let go.

There are, of course, many fields

in chemistry and a young chemist should decide as early as possible which one he would like to follow, in which one he would be happiest.

Thomas Carlyle said, "Blessed is he who has found his work; let him ask no other blessedness."

The chemist is on a professional pedestal, where everybody can see him and his actions.

He must have integrity. I recall Prof. Chandler of Columbia told us about a French chemist who analyzed a rock and in spite of his care his results added up to much less than 100. However, he felt so sure of his methods and work that he publicized his results. Years later, it was found that the rock he had analyzed contained the newly discovered element, caesium, and not potassium as he had supposed, and with this knowledge, his results were found to be excellent.

A chemist must always be fair. I remember Booth Tarkington's *Monsieur Beaucaire,* and how the hero was drawn into a card game in which one of the players tried to use shady methods. M. Beaucaire arose and politely said, "M. Beaucaire is always fair, always fair."

A responsibility of the chemist is always to be fair, to disseminate accurate information and to give the true place of the scientist in human life.

Witness a saying of Francis Bacon, "No pleasure is comparable to the standing upon the vantage ground of truth."

A chemist should always keep good notes, both for general use and also for possible patent purposes.

In an industrial or other organization, the chemist's interests are his employer's interests, and vice versa.

A chemist should join a chemical society, the American Chemical Society, THE AMERICAN INSTITUTE OF CHEMISTS, and/or The American Institute of Chemical Engineers. He should take part in local section activities, become acquainted with local associates and with national lecturers and officers, and attend national meetings whenever possible.

In order that a chemist may be able to fulfill his responsibilities he should keep himself well, "physically fit, mentally alert, and morally straight." He should be enthusiastic. He should not do anything to lose his self-respect, because when that is lost, everything is lost.

Chemists receive much; they should pass on much. May we so act that those who follow us can say of each of us, "He served his profession well."

Again, Francis Bacon, "I hold every man a debtor to his profession; from the which, as men of course do seek to receive countenance and profit, so ought they of duty to endeavor themselves by way of amends to be a help and ornament thereunto."

Professional standing is not attain-

ed just by aspiration, but only by hard work and perspiration.

More can be said by means of a few examples than by many words. Let us note what a few successful chemists have done and how they did their work. There is no question of their professional standing. "By their fruits, ye shall know them."

Leo H. Baekeland—Benefactor of men through his application of scientific knowledge in the photographic and plastic industries.

Marston T. Bogert — teacher, scientist, humanist; also a marvellous presenter of medals.

Irving Langmuir—keen observer and interpreter of intrinsic scientific phenomenon.

Gilbert N. Lewis—physical chemist, atomic theorist.

Arthur D. Little—counsellor to industrialists who placed his knowledge of chemistry, industry, and business at the disposal of almost avid and science-hungry business men.

Thomas Midgley, Jr.—thoughtful experimenter in fields of chemical knowledge outside the scope of his college training, and explainer of his ideas in wonderful and dramatic fashion—lead tetraethyl, synthetic rubber, and freon.

In closing, may I quote from Shakespeare, and add a phrase,

> "Neither a borrower nor a lender be;
> For loan oft loses both itself and friend,
> And borrowing dulls the edge of husbandry.
> This above all: to thine own self be true,
> And it must follow as night the day
> Thou can'st not then be false to any man."

In thy profession.

Appointed: By President Truman, the following scientists to the Science Advisory Committee of the Office of Defense Mobilization: Chairman, Dr. Oliver E. Buckley, chairman of the Board, Bell Telephone Laboratories; Dr. Detlev W. Bronk, president, Johns Hopkins University; Dr. William Webster, chairman, Research and Development Board; Dr. Alan Waterman, director, National Science Foundation; Dr. Hugh Dryden, Committee on Scientific Research and Development; Dr. James B. Conant, Hon. AIC, president, Harvard University; Dr. Lee Dubridge, president, California Institute of Technology; Dr. Robert F. Loeb, College of Physicians and Surgeons; Dr. J. Robert Oppenheimer, Institute of Advanced Study, Dr. James R. Killian, president, Massachusetts Institute of Technology; and Dr. Charles A. Thomas, Hon. AIC, president, Monsanto Chemical Company.

The Chemist and World Federal Government

Dr. Charles C. Price, F.A.I.C.

Head, Department of Chemistry, University of Notre Dame, Notre Dame, Indiana.

(Abstract of a talk given before the AIC Annual Meeting on May 11, 1951, as part of the Symposium, "Responsibilities of the Chemist in a Changing World.")

SINCE the professional aim of the chemist is to have his science serve humanity, we cannot ignore the end use and application of the vast new powers we have helped to place in the hands of human society. This power, and the ever-greater power of the future, is not of itself moral or immoral, ethical or unethical. The uses to which it can be directed may be constructive, moral or liberating—or they can certainly be obstructive, immoral or enslaving. Each of us must accept our full responsibility, as scientists, as professional chemists, as human beings.

My interest in expressing my feeling of responsibility in work for World Federal Government rests on two facts and two lessons of history. The facts are:

(1) Scientific progress in communication, travel, and transportation has made the world physically one interrelated community.

(2) The A-bomb has given this community a great new unifying interest in survival, in the elimination of war as a mechanism of resolving conflict.

The lessons of history are:

(1) That civilizations must meet challenges, must adapt themselves to change, such as the challenge we face in the present world crisis, or perish.

(2) No community in history has been able to exist long with peace, justice, or freedom among its citizens without government; that government is a necessary, although not a sufficient condition, for peace, freedom and justice.

These premises lead inescapably to the conclusion that some form of government for the world community is a necessary condition for peace, for freedom, for justice in the world. This government should be a world federal government:

World—because it must cover the world community.

Federal—because it must be limited to the area of affairs in which the people of the world have a common interest, a common need—the regulation and control of armament.

Government—because it must be able to act to enforce the law in this

area automatically and against individuals.

Desirable as this goal may be, I would be irresponsible, if in speaking to you of it, in devoting my time and effort to it, I did not feel it was both possible and in the best interests of the American people.

The way to achieve it is clearly through giving the necessary authority to the United Nations. Some things have been done, like the "Unite for Peace" plan to circumvent the veto in matters of aggression. Other things can be done immediately to build the United Nations into a more effective instrument to meet the world's needs.

1. We should immediately proceed to implement proposals for a United Nations' armed force.

2. We should immediately and to the fullest extent possible increase our contributions to the voluntary agencies of the United Nations in meeting fundamental needs:

The FAO to relieve hunger

The WHO to relieve preventable disease, and

UNESCO to relieve human ignorance

The United States should assume world leadership in working toward a United Nations Charter Review conference, whose object should be to establish in the UN defined authority to prevent preparation for aggression, not merely to meet it when it comes. This could be done by giving the UN authority to regulate and control all armaments throughout the world, achievement of which would release for the satisfaction of human needs much of the effort now devoted to war. It is not only America's moral responsibility to assume leadership for this goal, but in terms of world politics, regardless of Soviet action and attitude, such leadership is bound to contribute immeasurably to our cause of freedom and justice.

Action in Congress, the recent Gallup Poll indicating 3-2 support by the American people for the world federation resolution in Congress, the recent statement in support of the work and objectives of world federalists by Pope Pius XII, even the recent vigorous political opposition in this country, all support my conviction that this idea is a great idea, an idea whose time has come, an idea that is rapidly becoming an active political issue—perhaps one of the great political issues of all time.

Because science has done so much to create the present crisis, the present opportunity, which is both the fear and the hope of the future, I hope you can understand why I am so interested in this political issue, why it has lead me to activity in the field of practical politics. It is in fact an expression of my professional responsibilities—and of my responsibilities as an American citizen.

The Chemist and His Neighbors

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(An abstract of a paper presented at the AIC Annual Meeting, May 11, 1951, as part of the Symposium on "Responsibilities of the Chemist in a Changing World.")

EVERY worker in science or technology is confronted with a mass of information in his own field which is too great for him to master. Most of us resolve the difficulty by learning as much as we can in small areas which tend to be narrower as the literature piles up. We owe an enormous debt to the abstract journals which help us to find quickly the work related to our specific interests but, projecting the curve which represents the increase of technical knowledge, the problem seems almost insuperable.

Some compromise is necessary and here again the abstract journals enable us to be aware of broader areas which give a background for our thinking. Our courses of study or judgments of value are often affected by such background knowledge. Even people with the capacity to store encyclopaedic masses of information must deal somehow with problems of decision in matters where they lack expert qualifications. How many of us know enough to determine our diet, to choose a wife, or to determine the best education program for our children?

The humorist who described engineering as the art of drawing sufficient conclusions from insufficient data put his finger on a predicament that confronts us all. Indeed in an absolute sense we can never hope to know enough to really understand even the simpler phenomena of science. We must find our way with imperfect sight aided by some sense of direction or validity. General orientation on the nature of matter and energy, even though the level must be superficial, is essential to the practice of chemistry or to the driving of an automobile. Other sciences impinge on the work of each of us. The point will be clear without further elaboration.

It has often been argued that the scientist can stick to his laboratory and assume no responsibility outside the immediate field of his work. Even his most specialized operations cannot be done without services of supply, of apparatus, literature, transport, food, shelter, and a thousand minor conveniences which in the end involve the whole community. What he does affects his family, the fellow members of his

profession and the intricate structure of commercial, labor, manufacturing, and other groups of civilized society. If he aspires to material rewards for his efforts, he must recognize that industry pays not only for technical proficiency which is bought for modest sums but reserves its best recognition for leadership which depends on knowledge of people and adjustment to their ways of thought and action. He is, whether or not he likes the idea, a social being dependent on his neighbors. The argument that he has no responsibility to them will be hard to support. The plea of the lack of special knowledge will not be sufficient in the broad field of human relationships. There is a spirit not easily defined but fortunately readily recognizable which gives quality to the relations between people. With it cooperation is natural. Without it, however correct the argument, there is tension and distrust. Faith and loyalty among people are not expressed in metric terms but this should not be too disturbing to the chemist who in the practice of his profession must daily deal with materials and phenomena which he does not fully understand.

It is pertinent to ask what the chemist has to offer as a result of his scientific work which can benefit the neighbors. For some there is an easy answer in counseling on water supply, sewage disposal, sanitation or other matters in the chemists immediate field but it is not of these that I would speak.

The Scientific Philosophy

The scientist has a type of training and an attitude of mind toward his observation which could be of great use if applied more generally. He thinks critically and is not easily swayed by ill-founded assumptions, fear or hysteria. He descriminates between the fundamental and the trivial. Tests of purity or performance and not fancy labels or loud assertions of merit determine his choice of materials. He would not tolerate a prejudice against colored reagents. He views the traditions of the alchemists as interesting history without giving them any weight unsupported by present knowledge. He differs from the lawyer in his view of precedent and in his confidence that natural law is dependable. He will ask more often than the psychologist or the educator of the young—what is the meaning of tests? What is the thing measured? He will see the advantage of a broad perspective, of a sense of direction. He will have a confidence that solutions can be found for problems to which there is no present answer. As a scientist, he will know that no nation or race has a monopoly of scientific knowledge or development and that the perspective of a variety of experiences makes for insight. He knows that freedom of discussion and exchange of informa-

tion is the life blood of science and that restrictions of whatever sort—commercial policy, language barriers, political or military controls, impair scientific progress.

The point of view here indicated is not limited in its application to science and technology. It can go far toward the development of a wholesome mental attitude in the community at large. As some of the best teaching occurs by infusion and example rather than by direct indoctrination the chemist will do well to consider his opportunities for service in social groups, welfare projects, boys' clubs, where he should welcome such openings as come to make his philosophy known.

Freedom

Freedom is everybody's job and it is a tremendous task to liberate it from fear, superstition, and a narrow provincialism which all of us know among our neighbors. Freedom is a plant that grows by cultivation in a favorable atmosphere and this in turn can be created by persons who will accept the discipline of working at it. Though it involves the minds of millions of men, its concepts have to be accepted by individuals separately and each of us who sees the light must work with but a few. Here the experience of the scientist with small beginnings should protect us from discouragement. The correctly oriented molecule makes its contribution to the larger whole.

Peace

Peace is the great problem of our time. Almost everybody wants peace but almost everybody assumes that peace is impossible. It is as if we despaired of using nuclear energy because we could not bear to give up the well-established idea of the atom as the ultimate subdivision of matter. Quite evidently a bold new type of thinking is required. The experience of the scientist should qualify him to grasp the problem. His imagination should let him see that the whole human race is involved and make him doubtful of solutions which isolate a privileged class. It involves better conditions of health, both physical and mental and the two are closely related, for the hordes who constitute the great majority of our species. They need technical resources which are known to us. They need too a sense that their interests are having attention. They need a sense of belonging to the great human family of which they have become aware through modern technology of communication. We know experimentally that wholesome attitudes can be generated, based on confidence which has to be earned by disinterested action. The return of the Boxer indemnity to China and the exchange of students is a notable example. We could wish that every young person, especially every young scientist could have an experience of life in a household where his mother tongue is not

known, and study in a university where approaches new to him give perspective which cannot be had in the home town. Friendships with people of different experience can enlarge his sympathies and understanding. These often come when the American has the privilege of being the foreigner or when two people of different types join in a project of unselfish effort to meet the need of less privileged persons or groups.

A down to earth project of village sanitation in Mexico done by young people from both sides of the border changed the attitude of the whole community from a scornful view of "Gringoes" to a warm feeling of friendship.

We know too that confidence can be broken down by bad actions or false propaganda. But the problem is one of building—of creation and the mind experienced in research should be best able to see it whole and to start building.

When the problem is grasped we shall have to invent methods and apply the new techniques not to dead matter, not in terms of force which does not move the minds of men, but in ways which work from the inside out. Here is the difference between molecules and men. Though the problem can easily be written off as hopeless, consider the marvels of achievement in physical science within the short span of a single lifetime. Let us dedicate ourselves, each to make his contribution to reclaiming the spirit of men from fear, frustration, superstition, prejudice. We can each do a part through clear thinking based on science and feelings of responsibility to neighbors near and far. Thus we shall do our bit for the great cause of freedom. Walter Lippmann has eloquently spoken of the "science that can only flourish in free societies" and of "the magic of freedom to arouse the best in men."

Responsibility

It is important to keep before the neighbors the basic ideas of freedom and responsibility. Otherwise we may too lightly assume that organization, legislation, and power are enough to maintain a free society. It is a discipline first to understand and then to practice the responsible and, if need, the sacrificial work which it entails. As we increase in numbers the organization of our affairs becomes necessarily more complicated but too much control is inimical to the spirit of freedom. We have the example of Nazi Germany. Some of our own bureaucrats are thinking along lines of rigid and complete specification of our lives, but the statement of William Penn is still valid. "That government is best which governs least because the people have no need to be governed."

To earn the right to freedom we must be the kind of people that behave without being coerced.

For those who come to a deep

sense of responsibility for the creative work of freedom, another and more difficult question arises. To what extent can we leave to others the responsibility for the end use of our technical work? If building is our task can we in good conscience be agents of destruction? The idea of freedom requires the facing of responsibility here also.

The Continuing Self-Education of the Chemist

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(Presented at the AIC Annual Meeting, May 11, 1951, as part of the Symposium on "Responsibilities of the Chemist in a Changing World.")

WHEN the writer was a senior student thirty-six years ago, he was summoned one day to the office of the head of the Department of Chemistry in his university. The conversation started about like this. "Kirk, I want to be sure when you get your degree this year, you will not imagine that you are educated". It may well be that if the young man who walked into the office that day should today walk into my office, I would not recognize him. I wonder sometimes whether I would make now the same judgment that was made about me then. You see that the judgment was that I was in need of friendly admonition. As I look back across the years, I am certain that I deserved the warning and merited the admonition. I had earned rather good grades in my courses. I had been willing to do the "academic busy work" that some university teachers required in those times, and even now, in the fond belief that the student who did the "busy work" would certainly acquire thereby a thorough knowledge of the subject matter. I must confess that I had not yet realized fully that my own mastery of ideas was more important than my ability to regurgitate facts or theories upon demand. I now believe that the time spent on the "busy work" was time wasted.

With this preface, intended primarily as an apology, I shall start my sermon on the responsibility of each person in the profession of chemistry for continued and continuing self-education.

It is, of course, apparent to every chemist entering his profession that he has a continuous obligation to broaden and strengthen his knowledge of scientific and technical things. The breadth of the profession of chemis-

try soon startles him into a realization that the knowledge needed is knowledge covering a much wider field than that suggested by the curriculum from which he has emerged. He soon discovers that it is sometimes much more important to acquire additional ideas than it is to explore the intricacies of matters already within his field of observation. He must resist the temptation to explore by himself only those fields that are currently of greatest interest to him. The man who is fascinated by quantum theory may need also to know something about market research. He may even decide that modern economics is not mastered by slavish adherence to the dogmas of either Marx or Adam Smith or by the use of the current slogans of politics. The man who is intrigued with the fascinating possibilities of market research should beware the assumption that he need not concern himself about quantum theory. If this leads him into matrix algebra, he may find out that higher mathematics means more than sophomore calculus.

The young chemist soon discovers that there are many angles to self-education. An expenditure of a modest percentage of his income for scientific journals and scientific books and for membership in scientific societies becomes very important. He soon learns that the book or journal on his own desk is many times more valuable than the same book or journal on the library shelves. Libraries are excellent for planned literature searchers. They are equally good for browsing. The books or journals in the library are never quite the same as those on your own desk. In my observation, this is particularly true of *Chemical Abstracts*. A tribute is in order here to the self-sacrificing scientists who write the general articles and the review articles that mean so much in the continuing self-education of the chemist. These are the ones to keep on the desk.

Meetings of scientific and technical societies play a large role in the continuing education of the chemist. One should beware the glib assertion that "I know nothing whatever about this subject so why should I go to the meeting?". Many times this is the real reason why one should go! Our colleagues who devote time and energy to the preparation of well organized and challenging talks before scientific and technical societies are persons who, in reality, have agreed to do part of our own self-education for us. Why should we pass up this help in our own education?

One of the most outstanding developments of recent years in many centers of chemical industry has been the development of special lecture courses given at times and in places that are convenient to chemists. Each American Chemical Society Section that has organized such lecture courses has been both pleased and

surprised by the response. In many industrial centers, colleges and universities have carefully planned evening school programs at both the undergraduate and graduate level which can, and do contribute greatly to the continuing education of the chemist. Their success is a tribute to their effectiveness. Their number is testimony regarding their usefulness. The mind can still function after sundown. In many communities, one finds a considerable number of classes in adult education. Many times, these deal with scientific subjects as well as more general ones.

The special programs involving co-operative study, sponsored by both industries and universities are also noteworthy as an illustration of the recognition by top management of the importance of continued self-education.

Professional Development

The development of the chemist as a professional man is also a development related to his own continuing self-education. It is obviously impossible to dissociate this development completely from development in scientific and technical matters, since they are so closely interrelated. It is also apparent that both the formal and informal contacts involved in the activities previously referred to afford excellent opportunities for professional development. Service in and for local sections of the American Chemical Society, participating in the work of committees, activities as section officers—all of these develop the professional interests and aspirations of the participants. The local chapters of The American Institute of Chemists are specifically intended to develop professional interest and to further the close friendships that are so helpful in professional development. Top management has long recognized the importance of professional associations and has sponsored groups to aid in its development. Many industrial companies look with great favor upon extended participation by their employees in professional societies and many organizations are willing to have their facilities used to foster the growth of professional organizations.

Cultural Needs

In a discussion of the continuing self-education of the chemist in scientific and technical and in professional matters, one must never overlook the over-riding importance of his concurrent development as a member of a civilized society. No profession can possibly operate in a vacuum. We are all of us part of the culture in which we live. If we understand that culture better, we shall be able to contribute in larger measure to its improvement and even to its retention. Someone has said that if one does not know the history of the past, he remains forever a child. One who does not gain added knowledge of the social, the economic, the religious,

and even the anthropological sources of our modern culture has not lived up to his obligation as an educated man. One of my good friends, who is a prominent engineering educator, has said often, regarding the cultural training of the engineer, that the cultural level of any engineer is closely related to what he read after 6:00 p.m. during the first ten years that he was out of college. I am sure that this is equally true of the chemist. I do not mean that anyone should rigorously exclude from his reading anything that is entertaining. Nor do I mean that he should seclude himself evening after evening with books. I do mean that his reading should be planned to include those things which will aid him in understanding better why the world is as it is and why people behave the way they do. Reading should be done for pleasure but great pleasure can be found in acquiring additional knowledge in cultural fields.

Perhaps you know the story told about John Kieran and its explanation of how he became "the encyclopedic John Kieran" of "Information Please." The story goes that as a young sports reporter he discovered during the ball season that each city that had a major league ball team also had outstanding museums, art galleries, and libraries. His relaxation from ball games was found there as well as in more mundane pleasures. I doubt if anyone would argue that this division of his "out of hours" time had resulted in him becoming a "dry as dust" pedant.

I commend to every young chemist the public library in his home town. I commend to him the renting libraries. I commend to him the museums and art galleries. One who changes trains in Chicago may oftentimes choose between a newsreel and the Field Museum. One who changes trains in St. Louis will find much of interest there which will broaden his cultural horizon even though only a few hours are available. The story is the same in Kansas City or in Minneapolis or in Cleveland. Do not be obsessed by the idea that cultural advantages of this sort are only to be found in New York and Washington.

In the towns large and small across the United States, one finds continuously available study courses, lectures in adult education programs, symphony concerts, art exhibits, museums, etc. Wherever one is located is the place to continue his interest in general culture.

It is, of course, extremely surprising, at first thought, to be told that additions to one's knowledge about the general culture of our world will serve as an aid in his professional and scientific career, yet there is ample testimony that this is the case. Even at the level of appropriate and stimulating conversation during an interview for a position such interest and knowledge find their place. We have

said much in recent years about improving the professional and economic status of the chemist. We must not forget that we are in an area where the space paradox is especially worthy of note. I refer, of course, to the paradox that in human affairs the whole is always greater than the sum of its parts. Who could hope to fully appreciate the modern world better than can one trained in science?

The chemist who adds to his own knowledge and understanding in all the fields of culture will be a better chemist, a better citizen and a better human being.

Benzene from Petroleum— How and How Much

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(Presented at the AIC Annual Meeting, May 11, 1951 as part of the Symposium on "Progress in Research.")

THE five-fold increase in use of benzene as a chemical raw material over the ten year period from 1940 to 1950 has brought about an acute shortage. This shortage is becoming more critical with the rapidly increasing demands resulting from our mobilization program. Even under normal conditions, the growing consumption of benzene-derived civilian products would present a sizeable problem. The consumption for various products in 1948 and 1950, and estimates for 1951 on the basis of normal increases are listed in Table I.

The actual requirements for 1951 will undoubtedly be higher than 232 million gallons because of defense needs. About 252 million gallons has been estimated as the actual amount in demand. This quantity would necessitate an increase of 33 per cent over the 1950 production of 188 million gallons. Looking five years ahead, demands are expected to be far greater. It has been estimated that if mobilization continues, 411 million gallons will be needed by 1955. The estimated annual benzene requirements for the five year period from 1951 to 1955 are given in Table II.

The necessity of expansion to meet these requirements is evident from construction which is already planned or under way to increase production of benzene-derived products. Styrene capacity is being increased by about 200 million pounds a year which will require about 30 per cent more benzene than is now being used for that purpose. Phenol, the second largest consumer of benzene, has a present capacity of 350 million pounds per year and is being expanded by about 43 per cent or 150 million pounds.

TABLE I[a]

CONSUMPTION AND REQUIREMENTS OF CHEMICAL GRADE BENZENE
(Millions of Gallons)

Product	1948 *Consumption*	1950 *Consumption*	1951 *Requirements*
Styrene	47	65	82[b]
Phenol—Synthetic	39	41	50
Nylon	18	20	25[b]
Aniline	13	14	16
Synthetic Detergents (Cyclic)	7	10	12
DDT	1.5	5	6
Dichlorobenzene	5.5	5	6
Monochlorobenzene—other than Phenol, Aniline, DDT	5	5	6
Nitrobenzene—other than for Aniline, DDT	4	4	4
Maleic Anhydride	2	3	4
Diphenyls	3	3	3
Benzene Hexachloride	1	2	3
Miscellaneous	14	10	15
Exports	2	1	—
Total	162	188	232

a.—Data presented by L. A. Schlueter, Chief Aromatic Chemical Section, Chemical Division, National Production Authority, before the Chemical Market Research Association, December 6, 1950.
b.—Data presented by L. A. Schlueter before the Synthetic Chemicals Association on March 15, 1951.

TABLE II[b]
ESTIMATED BENZINE REQUIREMENTS
(Millions of Gallons)

Year	*Total Requirement*	*Percent Annual Increase over Preceding year*
1950	188	—
1951	252	34.0
1952	307	21.8
1953	338	10.1
1954	379	12.1
1955	411	8.4
Total % Increase over 5 year period		118.6

Aniline, now in short supply because of increased requirements for processing synthetic rubber, will be increased at least 20 per cent in the immediate future. Broad expansion of facilities for making other products is planned. It has been stated that although detergent capacity in 1951 will be on the order of 1.2 billion pounds, it would be increased to 2 billion pounds if sufficient benzene were available.

Even in the happy but doubtful event that mobilization requirements should be less than anticipated, demands for benzene will necessitate large increases in production. It must be remembered that estimates for growth are based on the consumption of known products, many of which were not on the market ten years ago. It is safe to assume that many new products will be developed through research. Civilian requirements for benzene will probably rise markedly, if the commercial development of new

products is not hampered by restrictions on the construction of plants to manufacture them. Every effort should be made to reach a production of over 400 million gallons of benzene annually by 1955.

With present capacity stretched to its limits, every potential source is being studied. These include coke-oven operation, imports, coal hydrogenation and petroleum. Present indications are that almost all of the increases will necessarily come from petroleum. Formerly the entire benzene output was derived from coke-oven operation which is tied to steel production. The rise in demand for steel has been less than one-fourth as great as the increase in chemical grade benzene requirements. It is also true that in the expansion of steel production, provisions for increasing light oil recovery and refining equipment were omitted in some cases. Furthermore, some gas plants found that it was more profitable to leave the light oil in the gas. The recent increases in benzene prices, however, are making maximum recovery more attractive. Studies are being made to increase light oil recovery in existing plants so that 10 million gallons more of benzene will be made available annually. It is believed that an additional 10 million gallons can be made by expanding coking capacity as now planned. These increases would raise coke-oven benzene production from the present rate of 170 million gallons to 190 million annually. This amount, however, is the maximum expected from the steel industry. To meet requirements of 307 million gallons in 1952, about 120 million gallons must be derived from other sources.

Imports have been increased and are expected to reach 40 to 50 million gallons in 1951. The shortage of benzene, however, is world-wide and it is doubtful that imports can be maintained at this level. As a matter of fact, they may be cut off entirely.

Coal hydrogenation as a source of benzene has also been the subject of much study and discussion. It has been estimated that two plants for the production of synthetic fuels would produce over 30 million gallons of benzene yearly as one of the products. In addition to other economic drawbacks, the initial cost of the two plants is reported to be about $325 million. Moreover, construction would take from two to three years and would utilize large quantities of materials which should be allocated to industries with proven ability to produce benzene. In contrast, construction to produce this quantity of benzene from naphthenic petroleum stocks would be on the order of only $33 million and construction could be completed in about a year. It does not seem rational to attempt to meet benzene requirements by coal hydrogenation.

Assuming maximum production from other sources, about 70 million gallons of petroleum-derived benzene will be needed in 1952 to satisfy total demands of 307 million gallons. Although present production by the petroleum industry is at the rate of only 12 million gallons per year, a number of new plants are either in the design or construction stage. Certificates of necessity have been granted for plants totalling 30.5 million gallons capacity (as of March 24). The oil industry has also applied for certificates of necessity to build additional plants which would increase benzene production by at least 30 million gallons per year. If construction is allowed to proceed, the additional capacity would raise the production from petroleum to over 72 million gallons per year. If predicted amounts are available from other sources, production should reach a rate of 312 million gallons during 1952 as shown in Table III.

Within the next five years, however, at least 100 million gallons additional capacity will be needed, and, in case imports fall off, about 50 million gallons more. The increased interest of the petroleum industry in producing benzene indicates that these requirements will be met.

At present benzene is being derived from petroleum by adaptations of the Hydroforming process which was used during World War II for producing nitration grade toluene. In the interim since World War II, a number of Hydroformers have been used for upgrading low octane gasoline into high, and more of these units could be converted to benzene production. Another process, in which two stages of processing are used, is being operated by Shell. In the first stage, methylcyclopentane derived from natural or straight-run gasoline fractions is catalytically isomerized to cyclohexane. The isomerization product plus additional cyclohexane present in the gasoline fractions are then subjected to dehydrogenation over a second catalyst.

TABLE III
BENZENE CAPACITY, PROJECTED FOR 1952

Source	*Production (Millions of Gallons per year)*	
Petroleum[c]		
Present	12	
Projected (Approved)	30.5	
Projected (Applied for)	30	
Total		72.5
Coke Ovens[b]		
Present	170	
Projected Increased Capacity	10	
Projected Increased Recovery	10	
Total		190
Imports		50
Grand Total		312.5

c.—Chem. Ind. Week 68, No. 10, 13 (1951)

Recently new catalytic reforming processes and new catalysts have been developed. They will be utilized increasingly in the new plants being constructed. One of these processes, called Platforming, is already in commercial operation for upgrading gasolines, and other units are now in

the planning, design or construction stage for the production of benzene. Plant operation specifically carried out for the production of aromatics has shown that the process is particularly well suited for that purpose.

The most suitable stock for benzene production in Platforming operations is the fraction containing mainly C_6 hydrocarbons from a highly naphthenic gasoline. This fraction contains large percentages of methylcyclopentane and cyclohexane which are converted in one stage to benzene in contrast to some other processes which require two stages. The yield of benzene from C_6 naphthenes in a single pass is 80 per cent of the theoretical and may be increased by recycling.

The U.O.P. Platforming process utilizes a catalyst containing platinum. It is a continuous process inasmuch as periodic regeneration of the catalyst is not necessary. The principal reactions which occur are dehydrogenation, hydrocracking, isomerization, and desulfurization. The small percentages of benzene already present in charging stocks go through the process without change. Aromatics result from the dehydrogenation and isomerization-dehydrogenation of naphthenes. Only minor quantities of aromatics are produced through dehydrocyclization of paraffin hydrocarbons. The hydrocracking reaction is essentially a simultaneous cracking-isomerization - hydrogenation reaction of paraffins. For example, *n*-decane produces *n*-pentane and isopentane, butanes and hexanes, and propane and heptanes. This reaction also takes place to some extent with naphthenes but can be practically eliminated by controlling conditions. Low pressures favor dehydrogenation to aromatics while high pressures increase the hydrocracking reaction. The flexibility which these reactions permit makes it possible to carry out highly selective operations for the production of aromatics.

The gasoline fractions used in Platforming always contain paraffins in addition to the naphthenes, the relative percentages varying with the specific crude oil source. Consequently, gasoline is produced along with aromatics. Under the conditions used for aromatic production, the paraffins undergo isomerization to more highly branched compounds with the result that gasoline of improved octane number is obtained along with the aromatics. This point is of high importance in the over-all economics of aromatic production.

The quantities of benzene potentially available from petroleum are tremendous. In estimating these amounts, production of 2,300,000,000 barrels (42 gals. per bbl.) of crude oil for 1951 in the United States is used. Data obtained from Platforming operations indicate that the potential quantity of benzene available

from the 1951 crude oil production is 825 million gallons.

A discussion of the production of benzene from petroleum would not be complete without some mention of toluene and the C_8 aromatics. These compounds are produced by the same processes as benzene and in much larger quantities. Their importance in our economic picture is also great.

Toluene, as a basic material for TNT and as an aviation gasoline component, is of particular significance in our mobilization program, and, in case of war, will be needed in far greater quantities. The C_8 aromatics, which include *o*-, *m*-, and *p*-xylene and ethylbenzene, are becoming increasingly important chemical intermediates. Phthalic anhydride, which was once produced entirely from naphthalene, has also been derived from *o*-xylene for several years. An increase in capacity of petroleum-derived phthalic anhydride is highly desirable because of the naphthalene shortage. The *m*-xylene is of importance as an aviation gasoline component and experimental studies show that it will have high value as a chemical intermediate. The new synthetic fiber, Dacron, is derived from terephthalic acid which is an oxidation product of *p*-xylene. Projected facilities for the manufacture of the new fiber necessitate a great increase in production of *p*-xylene. Ethylbenzene is the basic material for styrene which accounts for the largest consumption of benzene of any single product. By increasing ethylbenzene production directly from petroleum, the benzene shortage can be somewhat alleviated.

The quantities of toluene and C_8 aromatics available from U.S. crude oil by Platforming are roughly two and three times, respectively, that of benzene. A summary of the quantities of C_6, C_7, and C_8 aromatics potentially available from estimated crude oil production in 1951 is given in Table IV.

TABLE IV
AROMATICS FROM PLATFORMING, ESTIMATED YIELDS BASED ON 1951 CRUDE OIL PRODUCTION

	Million Gallons
Benzene	825
Toluene	1,650
o-xylene	500
m-xylene	1,100
p-xylene	500
Ethylbenzene	375

Platforming of the C_6, C_7, and C_8 fractions of natural gasolines (from natural gas) also yields aromatic hydrocarbons. On a basis of normal conversion, the potential yields of aromatics from U.S. natural gasolines on a basis of an estimated 1951 production of 110 million barrels are given in Table V.

TABLE V
AROMATICS FROM U.S. NATURAL GASOLINES, ESTIMATED YIELDS FROM PLATFORMING, 1951

	Million Gallons
Benzene	120
Toluene	230
C_8 Aromatics	85

Table VI gives a summary of the yields of benzene, toluene and C_8 aromatics which could be expected from use of Platforming both straight-run and natural gasolines.

TABLE VI
SUMMARY, AROMATICS FROM PLATFORMING, 1951 BASIS

	Total yields, million gallons		
	Benzene	*Toluene*	*C_8 Aromatics*
Platforming Straight-run gasoline	825	1,650	2,475
Platforming Natural gasoline	120	230	85
Total	945	1,880	2,560

Assuming for 1955 a total production of 3.1 billion barrels of crude oil and 150 million barrels of natural gasoline, an increase of about 50 per cent over 1950 in each case, the potential quantities of aromatic hydrocarbons available are summarized in Table VII.

TABLE VII
SUMMARY, AROMATICS FROM PLATFORMING, 1955 BASIS

	Total yields, million gallons		
	Benzene	*Toluene*	*C_8 Aromatics*
Platforming Straight-run gasolines	1,100	2,200	3,300
Platforming Natural gasolines	165	315	115
Total	1,265	2,515	3,415

Expansion of benzene production in the immediate future will come mainly from the processing of natural and straight-run gasolines. Although the production of the required amounts of aromatics will require substantial plant construction, the petroleum industry has the ability to go ahead. It has the technical know-how and the experience to carry out all necessary expansion at a rapid rate. If given proper encouragement and cooperation, the oil industry will produce any aromatic hydrocarbon demands in the foreseeable future.

Honored: The National Bureau of Standards by the Electrochemical Society in Washington, D.C., at its 99th convention, April 8th to 12th. A scroll was presented to Dr. E. U. Condon, director of the Bureau, by Dr. Charles L. Faust, the Society's president. At the convention, Dr. William Blum, Hon. AIC, chief of the Bureau's Electrodeposition Section, served as Honorary Chairman. Among papers presented were, "The Manufacture and Properties of Ozone," by Clark E. Thorp, F.A.I.C., and "New Luminescent Materials," by Dr. G. L. Putnam, F.A.I.C.

Promoted: Dr. Eugene McCauliff, F.A.I.C., to vice president in charge of sales of the Glyco Products Company, Inc., Brooklyn, N.Y. He has been in charge of technical service and development since 1944. Previously he was connected with the Hooker Electrochemical Company and Industrial Synthetics Corporation.

Recent Progress in Cosmetics

Maison de Navarre, F.A.I.C.

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(Abstract of paper presented at the AIC Annual Meeting, May 11, 1951, as part of the Symposium on "Progress in Research".)

THIS review starts about the time of the passage of the 1938 Food, Drug & Cosmetic Act. However, two important developments came before that, namely the commercial manufacture of triethanolamine which opened new horizons in the field of cosmetic emulsions; and the other advance came with the introduction of antiseptics into cosmetics to render them self-sterilizing, therefore more hygienic in use.

Antiperspirants

Because of the similarity of the products, antiperspirants are discussed with deodorants, for an antiperspirant, if effective, is usually a deodorant, although a deodorant is not a perspiration inhibitor.

The introduction of Arrid, the first commercial antiperspirant cream, so formulated that it had little rotting effect on clothing, brought into being two new concepts in this field. The first was the fact that the product was an emulsified *cream* antiperspirant, when others were clear aqueous liquids. The perfection of a stable emulsion of electrolytes was an achievement all its own. The second novelty was the use of a so called buffer, which bound the acid liberated by the aluminum salt as a result of hydrolysis, and prevented its tenderiz-action on fabric. This earned U.S. Patent No. 2,236,387 covering the use of urea formamide and acetamide as "buffers." This patent was litigated and invalidated by the U.S. Supreme Court in 1948.

With the introduction of buffers, patents were eventually granted to Montenier,[1] Klarmann,[2] Teller,[3] Richardson,[4] and others,[5] in this country and abroad. The buffers included various derivatives of nitrogen such as amides, imides and nitriles; oxides, hydroxides and carbonates of the alkaline earth metals; alkaline earth metal salts of mono and polycarboxylic acids and aluminum phosphate.

Antiperspirants became static for a while until the development of a basic salt of aluminum chloride, a so-called aluminum chlorohydrate sold under the trade name of Chlorhydrol. In this chemical the ratio of aluminum to chlorine is 2 to 1 instead of 1 to 3 which it is in aluminum chloride. This material had the

property of acting slower in its retarding action on perspiration, but it did not tenderize fabric anything like aluminum chloride did. Anderson[6] obtained a patent covering its use in antiperspirant products, which patent is currently being litigated. Aluminum chlorohydrate made it possible to develop the spray underarm deodorant-antiperspirant in polyethylene "squeeze" bottles.

During the last year Jenkins and Christian announced the synthesis and testing of a new chemical known as aluminum methionate,[7] said to have practically no tenderizing effect on fabric and to possess excellent antiperspirant properties. It is not in commercial use yet.

Since deodorants are also included in this review, it is necessary that both G-4 and G-11 be mentioned because they are used in the deodorant colognes and possibly in deodorant creams and lotions as well as in antiperspirant products. These two compounds are chlorinated diphenols with selective antiseptic properties, hence preventing sweat decomposition with its byproduct of body odor.

The latest deodorants are offered in small aerosol bombs for personal use.

Dentifrices

Two forward steps were made in dentifrice formulation in the thirties; they are the patenting and use of sodium alkyl sulfate[8] as a foaming agent and detergent. The other advance was the elaboration of sodium, calcium, and magnesium phosphates as polishing agents.[9] Then fifteen uneventful years went by before a new idea in treating dental caries was propounded by Kesel and others, resulting in the use of the so-called "ammoniated" dentifrice.

The products contain both diammonium phosphate and urea together with foaming and polishing agents, the idea being that in this media, the *Lactobacilli* are inhibited from multiplication and as a result caries resulting from Lactobacilli considerably reduced.

Two schools of thought developed, the so-called high urea[10] and low urea formulas[11] were promoted by each respective group.

The latest refinement in the field of dentifrices is the introduction of penicillin[12] at the rate of 1000 units per gram of dentifrice. At this writing, penicillin tooth powder is available on prescription only.

Penicillin is undoubtedly, the forerunner of other antibiotics to be added to dentifrices.

Facial Products

While all kinds of ideas are constantly being introduced into face creams and lotions formulations, only two really outstanding developments have taken place. The first is the addition of pure estrogens[13] into these products which enabled collogen bundles in the skin (in its late thirties or early forties and later), to hold more water, increase the capiliary

bed and number of mitoses taking place in the living layers of skin. As a result, aged skin looked more full and lively resulting in a more youthful appearance.

The other and more recent promotion has been the use of ozonides for the purpose of causing skin to peel as in keratosis. These ozonides according to Sharlit[14] are combinations of ozone with the double bond of unsaturated fats which in turn liberate oxygen readily in presence of moisture. Little further is known about them.

Hair and Scalp Preparations

Undoubtedly the best known attainment in the cosmetic industry in recent years has been the headway made by the cold hair wave; its commonest exponent is the home wave. Home waving without heat had been practiced many years[15] before the introduction of thioglycolate waving solutions. But without doubt Nelson Harris can be credited with popularizing the home wave as it is now known. His success parallels the large scale production of thioglycolates in highly purified form. For the thioglycolate reduced to a half hour or so the reaction time on hair formerly requiring four hours and more.

With the strong reducing action on hair, a strong oxidizing agent was required. Potassium and sodium bromates were ideal for the purpose. More recently they are being replaced by sodium perborate monohydrate[16], usually containing an additive.

Stannites and titanates were introduced,[17] as depilatories but neither type of compound has been found sufficiently stable for commercial use.

Thioglycolates not only revolutionized hair waving but actually they were first used in cosmetic depilatories of the so-called odorless type. The Evans & MacDonoughs patent[18] issued recently covers the use of thioglycolates, among other sulfur derivatives in depilatories. The patent has been upheld in the Federal District Court for Maryland in 1947.

Less spectacular, but just as much an innovation, is the cream shampoo. Its origin is not too clear but to best knowledge, it was first introduced to beauty shops by a Dayton company, who probably being unable to sufficiently solubilize Duponol WA Paste in water, decided to take advantage of its nice solid pearly appearance per-se.

However the product turned semiliquid and transparent at temperatures above 65° F. Eventually one, then several companies learned to use hard soap among other things to keep the product stable and opaque at summer temperatures. The same idea has been adapted to liquid cream shampoos.

The aerosol shampoo is the latest bid for the buyers' favor. As you know, the can or bomb delivers the shampoo as a foam. The claim is that

it takes less shampoo as such to do the job of cleaning hair.

Another interesting discovery is the use of certain cationic compounds in producing a cream hair rinse to be applied after the shampoo, to give the hair a "hand" or soft feel, with gloss or sheen. While numerous cationic compounds exist and many of them will do the job, Triton X-400 stands out almost alone in this field.

The recent introduction of estrogens in scalp pomades for the purpose of growing hair has as yet not established itself as a useful treatment. While there is some basis in theory, time will tell if the product will work in fact.

The war brought to the front cream oil hair dressing, a liquid, water/oil emulsion that could be made without alcohol. Its perfection changed the hairdressing habits of Americans and brought a new vogue into being in this country, emulsified hairdressings being known for some years in Europe.

Make-Up

Best known make-up is Pancake which practically put face powder out of business during the last decade. Its composition is covered by two patents[19]. Variations of the patented products soon appeared and had their heyday too. Essentially, cake make-up is a powder with high covering power containing binder and wetting agents, pressed into cake form.

About the time cake make-up had seen its day, came the oil suspensions, of which Overglo was best known. It is patented in England[20]. Oil suspensions enjoyed top position in sales for a short while when the emulsified pigmented liquids made their debut. Ease of application and long-lasting properties brought them quick acceptance. One of the first, if not the earliest was Liquid Beauty, still going strong.

Simultaneous with the introduction of the liquid emulsions came the offering of Revlon Fashion Plate, a gelled, plate, oil cake make-up, made by gelling esters such as isopropyl myristate with carnauba or other waxes. They still enjoy considerable popularity.

During this time, Angel Face was developed, and outmoded the previous cake make-up which required a wet application. This new product is essentially a compressed powder with high covering powder that applies in the same way as ordinary compact face powder. Both above products were introduced in the Spring of 1947.

In the field of lipstick, Liptone was the first patented [21] liquid lipstick utilizing cellulose derivatives as film forming agents. Ethyl cellulose in a safe solvent dissolved and plasticized is the carrier for the coloring matter. The resulting product is used as a lip lacquer, drying rapidly to a smear-proof application.

Most recent trend in lip make-up is the Hazel Bishop type of lipstick which stains deeply but does not

smear. Just what is used in obtaining this effect in the commercial products is not known exactly. It is an established fact that tetrahydrofurfuryl alcohol[22] and its fatty acid esters[23] are excellent solvents for acid eosines or bromo acids as they are known; both the alcohol and the esters are patented for this use. In addition it is also known that polyethylene glycols and their derivatives are good bromo acid solvents.

Only in the last five years has rouge seen any major improvement although about ten years ago, a rouge in vanishing cream form was enjoying some popularity, but it had the drawback of changing color and drying out. The latest ideas are stable liquid emulsions. A drop when spread gives the required tinting effect to the cheek.

Mascara has had few innovations in recent time although currently it is being supplied as a superfatted alkanilamine soap containing insoluble pigments. In former times a hard, highly refined soap was used as a base, but unlike the present products it did smart the eyes. Soft emulsified cream mascara has also been developed. It dries to a waterproof film and is usually sold in small collapsible tubes.

World War II introduced two really unusual forms of make-up, one for civilian use the other for military use. The civilian discovered leg make-up[24] during the stocking shortage. The products were ingenious in that they did simulate stockings; when properly formulated and applied they did not smear or streak and they were fairly water repellent in their ultimate forms. Once stockings became available, leg make-up lost a major part of its market.

Military make-up was the camouflage sticks used by all branches of the service. It was quite unique in that its colors simulated earth or foliage. The base was a fatty vehicle that in its final form actually applied to sweaty skin as easily as to dry skin. It produced a dull, mat effect unlike the usual oily or glossy appearance given by fatty based make-up sticks. Millions of sticks were used in the war. Military camouflage was truly a product of the ingenuity of the cosmetic industry.

Manicure Preparations

After the introduction of cream or pigmented nail polish about twenty years ago, nothing really significant has been developed in this field. True the development of formaldehyde urea-sulfonamide resins as adhesives and additives has enabled the manufacture of better and longer lasting nail polish. Yet this is not a particularly great achievement any more so than the dozens of shades of nail polish that are offered. One patent[25] included ethyl cellulose and a surface active agent such as sodium alkyl sulfate or diglycol stearate which would be removed from the nails when placed into water thus enabling the

nails to breathe, yet keep the polish intact.

Another development does stand out although it is quite dead in its original patented[26] form and that is the application of an oil blend on top of the fresh nail polish to make it seem drier than it was and therefore enable the wearer to go about her work without fear of smudging.

Top coats and base coats, while new products are nothing unusual being modifications of nail polish itself.

Soaps

These comments are confined to bar toilet soap, for to list the advances in the entire soap field is a subject for review by itself.

To me the formulation of the army-navy all-purpose soap bar in the last war was quite an achievement. It blended together the best of both the synthetic detergent properties and of soap. The alkyl aryl sulfate type worked well.

Another refinement was the introduction of Dial deodorant soap which contained hexachlorophene as the antiseptic ingredient, the use patent[27] for which was issued late last year. By inhibiting the growth of bacteria on the skin surfaces such as under the arms, body odor is greatly reduced.

Hexachlorophene or G-11 as it is known in the trade is also used in one shaving cream for its antiseptic properties.

Another major but not ballyhooed advance was the introduction of Sapanox, a brand of O-tolyl Biguanide, a soap antioxidant, used throughout the world in the manufacture of good soap and products derived from it. The use of B-methyl umbeliferones to give the appearance of whiteness enabled soap makers to substantially reduce the amount of whitening pigments in fine soap. It later proved to be substantial to cloth, giving it a whiter look after washing, thus starting a new field of research.

Sun Screens

Man was on the track of adequate sun screens long before the scientific approach was developed. Tannin-containing substances have been widely used as infusions of various drugs. Even tea and cider vinegar were used before exposure to the sun.

However, chemical sunscreens made their appearance about fifteen years ago. It is not certain that the first patent[28] covered the use of naphthalene sulfonic acids, but if not, these were one of the earliest types of chemical sunscreens. They were closely followed by methyl salicylate[29]. From then on, numerous patents[30] have been issued to cover salicylates, ortho, meta and para aminobenzoates, powdered metals, dyes, azines, phenones, benzimidazoles, ethylene and propylene oxide reaction products of tannic acid, pyrones, umbeliferones; hydroquinone and esters of pyrogallol. In each case the screening compound should absorb about 95% of the range 2850 to 3200 Angstrom and

allow the longer wavelength to pass through.

Spectrophotometric testing has been elaborated for determining screening efficiency at various wavelengths. Clinical tests using human subjects with quartz mercury arc lamps or the Uviarc type of bulb lamps have been developed. Even so, these tests determine only part of the effectiveness of a sunscreen. The real test is on the beach. Sunscreens found effective by spectrophotometric and so-called clinical tests have failed on the beach and vice-versa. Stamboosky has devised a chart that predicts beach usefulness from laboratory data[31].

The valuable role played by sunscreens is not fully appreciated unless one had seen World War II survivors of bombed ships who had been on the ocean for a week or longer both with and without adequate sunscreen protection. The need for protection from the sun was so great that sunburn cream was standard equipment on all life rafts and lifesaving equipment at the turning point of the war.

A similar role was played by sunscreens in the air force and in ground forces in the tropics.

Other Progress

It is impossible to classify all forward steps by product types. Much progress must remain in other categories. Thus the last fifteen years have seen the introduction of methyl cellulose, carboxymethyl cellulose, hydroxyethyl cellulose, methyl ethyl cellulose, methyl hydroxyethyl cellulose, sodium cellulose sulfate, purified alginates, Irish moss extractives, acrylate gums, guar and polyvinyl alcohol, to mention the most important. These have opened new fields with their special properties not possessed by natural gums in common use. In some cases their properties overlap but in most cases each of the above have highly specialized properties that make them valuable for a specific job, because of stability or for other reasons.

Applications of these new materials would take pages to relate.

Hygroscopic Plasticizers

World War II in particular stimulated interest in this field of products formerly dominated by glycerin. It is true that some of the glycols were already well-known and widely used. Carbitol in particular was enjoying substantial sales in the cosmetic industry.

It is not often that a large chemical company drops a chemical that later becomes a tonnage item with a competitor. Yet that is exactly what happened with sorbitol. Fortunately for all industry during World War II, Arlex brand of sorbitol syrup[32] eased the glycerin shortage and established itself firmly in the field. In the meantime, one brand of propylene glycol[33] was so refined as to be water white and odorless. It was recognized by the National Formulary which adopted a monograph on it. Its safety

for internal and external use was established at the same time. It is good that Arlex and propylene glycol became so well-accepted for both have held their prices well, while glycerin succumbs to inflationary prices at the first sign of scarcity.

Hygroscopic plasticizers are used in cosmetics to retard drying in the container as in hand or vanishing cream, to enable easy spread on the skin without rolling, balling or separation of phases and to have an emollient effect on the skin, without sweating or stickiness.

Other commercial hygroscopic plasticizers developed are the carbowaxes, ethylene and propylene oxide derivatives of sorbitol, mannitol and other sugars. Amylosides, methyl[34] and ethyl glycerin, polypropylene glycols and their ethers are developed, but not all these are available in commercial quantities.

Anti-Oxidants and Preservatives

Not much happened among antioxidants for cosmetic use until a few years ago when N.D.G.A.[35] was introduced as an antioxidant for animal and vegetable fats. It has proven itself very useful. This was followed by the gallates[36], tocopherols[37] which are not allowed in U.S.P. mineral oil, and by butylated hydroxyanisole[38]. All are useful in animal, vegetable and mineral oils.

About the same time dehydracetic acid[39] was introduced as a preservative against mold, bacteria and wild yeast. The material is being used in drugs and cosmetics very satisfactorily, but it has not yet cleared for food use. It has the advantage over the 25-year-old p-hydroxybenzoates in that it is odorless and more effective in use, it is claimed. A series of esters of vanillic acid have been tested and reported[40] to be good preservatives. Ethyl vanillate is reputed to have the best all around preservative action.

Miscellaneous Materials and Products

During the period of this review a number of unusual solvents made their appearance. No attempt is made to describe the following materials in chronological order. Among them are hexylene and octylene glycols, butane diols, tetrahydro furfuryl alcohol and its derivatives, a host of so-called synthetic oils which are fatty acid esters of various polyols or their ethylene oxide condensates, the oxo liquid alcohols to name only some of the most prominent.

Oleyl, cetyl and stearyl alcohols though developed earlier, really did not reach their usefulness until the last few years. Most any combination of one or the other alcohol can be had at will. Carbonates, acetates and other fatty acid derivatives of these alcohols have also been offered for their special properties.

During this time a magnesium aluminum silicate of high purity made its debut under its trade name of Veegum[41]. The material has all of

the desirable properties of bentonite and none of the undesirable characteristics.

More recently the Bentones[42] or cationic bentonites have made their appearance. They are oil soluble and do in oil very much what bentonite does in water.

The host of emulsifiers based principally on glycerine, ethylene and propylene glycol, sorbitol and mannitol have been so refined that one can order them under any specification desired. These materials are finding their way into every conceivable emulsified product, in their different ionic forms.

To attempt to cover all of the surfacants developed during this era, by name only, would take a paper longer than this. Suffice it to say that the principle types were developed prior to 1938 with the possible exception of the non-ionics which have only recently come to the fore. Probably the most outstanding development in the non-ionic field is the production of a flake form of surfactant known by the trade name of Pluronic[43].

The cationic compounds have revolutionized the sanitation and antiseptic fields and generally speaking both are outside of the scope of this paper, with the exception of a limited few.

Cholesteryl ethers have been offered as superior water and oil emulsifiers although they are not commercially available in this country, having been developed in Australia[44].

A series of products derived from isopropyl and butyl alcohols and esterified with myristic, palmitic and stearic acids, alone or in combinations have made possible numerous cosmetic variations of specialties for they are substantially thin oil-like liquids. Butyl stearate[45] and a principal brand of isopropyl palmitate known as Deltyl[46] are best known. Most recently isopropyl palmitate earned a patent[47] for its claim to keep lanolin in large quantities, in solution with mineral oil.

While not new, so-called frozen or stick colognes made a major bid for sales during the last few years. They are alcogels, using sodium stearate as the gelling agent, in which the fragrance is dissolved[48].

Synthetic racemic methol, now official in the U.S.P. and so-called Homo-meta-menthol[49] chemically known as trimethylcyclohexanol, both relieved the shortage of menthol during World War II.

Lithium stearate is an insoluble metal stearate more readily wettable than other stearates, with better bulking properties.

Titanium dioxide and zirconium oxide are products of commercial development of the period under review. In fact titanium dioxide revolutionized cosmetic make-up formulation being an inert covering agent capable of being worked into many different formulations that would not tolerate

zinc oxide. Used as a stretcher or replacement for zinc oxide in World War II, it is now as difficult to get as zinc oxide, if not more so.

The number of qualified chemists in the industry has increased to the point where the Scientific Section of the Toilet Goods Association (the trade association of the industry) and the recently founded Society of Cosmetic Chemists regularly present many scientific cosmetic studies before several hundred chemists of the industry; fifteen years ago this would be an unbelievable possibility. This is one of the singular developments in the industry during the period under review.

Shaving cream progress is pretty static. The only significant patent in this field is granted to Fash[50] incorporating chromium derivatives in the brushless shave cream to prevent corrosion of the thin steel razor edge. Liquid shaving creams have been offered but are little more than dilute versions of the soap shave cream. Hollander and Casselman published a study of factors involved in satisfactory shaving[51].

Electric shaving is on the increase and with it are required lotions or powders to use in warm weather to dry the skin. Also needed are lotions to prevent corrosion and to sterilize the razor head.

Reverting to materials again we can't help wonder what role silicones are going to play in the cosmetic industry. Their interesting properties are already under test in the more alert laboratories.

Conclusion

The last fifteen to twenty years have seen great strides in the industry. The formation of a Scientific Section in the Toilet Goods Association and the beginning of the Society of Cosmetic Chemists portend further steps forward.

The cosmetic industry draws on many industries for raw materials from which numerous unusual products have been patented.

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Guest speaker: Dr. V. I. Komarewsky, F.A.I.C., professor of chemical engineering and director of the Catalysis Laboratory of Illinois Institute of Technology, Chicago, for the Societe de Chimie Industrielle, in the Maison de Chimie, Paris, France, June 12th. The subject of his lecture was "Aromatization of Hydrocarbons."

Safest Place to Work: Chemical plants; according to The Manufacturing Chemists' Association, Inc., which reports a record low of 4.56 injuries per million man-hours in 1950. Statistics were taken from the Association's member companies, representing about 90 per cent of total U.S. chemical production.

Negotiating: The Atomic Energy Commission with four groups of industrial firms under the program for expanded participation in reactor development projects. The proposals were submitted by the Monsanto Chemical Company and its associate, Union Electric Company of Missouri; the Detroit Edison Company and the Dow Chemical Company; the Commonwealth Edison Company and the Public Service Company of Northern Illinois; and the Pacific Gas & Electric Company and the Bechtel Corporation. No additional groups will be admitted to the program at this time.

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May Meeting

The 276th meeting of the AIC National Council was held May 10, 1951, at 8:30 a.m. in the Rainbow Dining Room, General Brock Hotel Niagara Falls, Ontario. President L. H. Flett presided.

The following officers and councilors were present: Messrs: C. A. Amick, G. Egloff, L. H. Flett, K. M. Herstein, H. O. Kauffmann, M. J. Kelley, L. N. Markwood, C. P. Neidig, J. W. Perry, George Rugar, R. Stevens, and J. R. Withrow. V. F. Kimball was present.

The minutes of the previous meeting were accepted.

President Flett called attention to the AIC dinner to be held during the week of the International Congress of Chemistry, on September 11th, in the East Ballroom of the Commodore Hotel, New York, N.Y.

The Board of Directors was requested to set a price to cover a life subscription to THE CHEMIST.

The Secretary's report showed that we now have a total of 2489 members. The following deaths were announced with deep regret: J. H. Kelley, Jr.,

F.A.I.C., on April 14, 1951, and C. W. Rivise, F.A.I.C., on April 24, 1951.

The following elections were announced: For councilors: Dr. M. L. Crossley (re-elected), Miss Florence E. Wall (re-elected), and Dr. John R. Bowman.

The report of the Committee to Study the Problem of Retiring Members was postponed until the June meeting of the Council.

The preliminary report of the Committee to Consider Scientific Manpower was read.

The report of the Committee on Greetings to the Fifth South American Chemical Congress, prepared by Miss F. E. Wall, was presented.

The report of the Treasurer and of the Auditor for the year 1950-51 was presented and accepted.

Mr. Markwood presented a copy of the *Capitol Chemist,* new publication of the American Chemical Society's Section in Washington, D.C., for the information of the editor.

The report of the Committee on Honorary Membership was referred to the June meeting of the National Council.

The following new members were elected:

FELLOWS

Gottlieb, Howard Lyle
Research Chemist, Radio Tracer. Bjorksten Research Laboratories, 323 W. Gorham St., Madison 3, Wisconsin

Harris, Walter W.
General Sales Manager, Harshaw Chemical Co., 1945 East 97th Street, Cleveland 8, Ohio

Jenkins, Ford McHenry
Technical Director, O - Cel - O. Inc., 1200 Niagara St., Buffalo, N.Y.

Liberthson, Leo
Technical Director, Building Products Div.; *Director* Patent Dept., L. Sonneborn Sons, 300 Fourth Avenue, New York 16, New York

Lieberman, Arthur Arnold
Manager, Technical Dept., Pemaco, Inc., 5050 E. Slauson Avenue, Los Angeles 22, Calif.

Stageman, Paul J.
Assistant Professor of Chemistry, University of Omaha, Omaha 1, Nebraska.

Whitfield, Robert Edward
Research Chemist, Application Research Dept., American Cyanamid Co., Bound Brook, N.J.

Wrisley, George A.
Vice President & General Manager, Allen B. Wrisley, 6801 W. 65th St., Chicago, 38, Illinois.

ASSOCIATE

Dippel, William Alan
Graduate Student & Instructor, University of Virginia, 41 University Circle, Charlottesville, Va.

RAISED FROM MEMBER TO FELLOW

Merzbacher, Claude Fell
Instructor of Chemistry, San Diego State College, San Diego, Calif.

Opportunities

Doris Eager, M.A.I.C.

Positions Available

Chemical Engineer: Process engineer, development and estimating on new processes. Inorganic and organic processes, work varied. Location middle west. Salary $7 - 9,000. Box 71, THE CHEMIST.

Chemist: Organic research, B.S., M.S., or Ph.D. Some experience required, natural products preferred. Location midwest. Salary dependent upon qualifications. Box 73, THE CHEMIST.

Chemist: Organic research grant with university located in the southwest. Box 75, THE CHEMIST.

Chemists Available

Patent Attorney. Ph.D. Columbia University, 1937, registered before U.S. Patent Office, over 5 years patent experience, plus 5 years industrial experience. Age 43, married and draft-exempt. Field of special knowledge, pulp and paper, petroleum, plastics, and synthetic paints. Box 70, THE CHEMIST.

First Lecturer: Dr. Alexander Silverman, Hon. AIC, when he spoke before the Keramos National Honorary Ceramics Fraternity at Pennsylvania State College, May 17th, on "The Newer Glasses." His talk opened the 1951 Lecture Series given by the Fraternity.

To AIC Members

Members of THE AMERICAN INSTITUTE OF CHEMISTS who are interested in locating positions in the chemical field, are invited to place their advertisements, without charge, in the Opportunities column of THE CHEMIST.

To Employers

Employers seeking new employees may list their available openings with Miss Eager at the A.I.C. offices, 60 East 42nd Street, New York 17, N.Y.

AIC Activities

C. P. Neidig, F.A.I.C.

Los Angeles Chapter

Chairman, Wilfred M. Noble
Vice Chairman, Dr. Edwin Goldsmith
Secretary, Frank Bewley
Treasurer, Spafford M. Gregory
Representative to National Council, Manuel Tubis

At the meeting of the Los Angeles Chapter held June 5th, the officers above were elected.

Also at this meeting student medals and Associate Memberships were awarded to winners at Loyola University, California Institute of Technology, the University of Southern California, Pomona, Redlands, and Whittier.

This has been a most successful

year with good attendance at all of the meetings. The interest of the members has been aroused to such an extent that retiring chairman, Dr. Romeo P. Allard, predicts that the next year will be an outstanding success.

Washington Chapter

Chairman, Louis N. Markwood
Vice Chairman, Milton Harris
Secretary, Paul E. Reichardt
Treasurer, John F. Williams
Representative to National Council, L. N. Markwood

The Annual Business Meeting of the Washington Chapter was held at the Jefferson Hotel in Washington, D.C., May 24th. Twenty-two members met for luncheon preceding the meeting. The Chapter was glad to welcome the chairman of the Philadelphia Chapter, C. P. Neidig. Visiting from Richmond, Virginia, was Dr. William E. Trout, of the University of Richmond. It was good to see one of our out-of-town members who does not have the easy opportunity of meeting regularly with us.

Chairman Markwood presented the highlights of the Annual Meeting of the AIC, held at Niagara Falls. His remarks pointed out the general excellence of the program and fellowship at the meeting.

The major item of business was the election of officers for 1951-52, who are listed at the head of this report.

Ohio Chapter

Chairman, Dr. George F. Rugar
Chairman Elect, Dr. Otis D. Cole
Secretary-Treasurer, Harold M. Olson
Representative to National Council, Dr. Malvern J. Hiler

The Ohio Chapter has awarded Student Medals this year to the following three outstanding seniors in Ohio colleges and universities: Norman Bates, Western Reserve University; Kenneth J. Bell, Case Institute of Technology, and George Omietanski, University of Dayton. The awards were made during the Commencement Programs of the colleges.

Speaker: Dr. Foster Dee Snell, former AIC president, and president of Foster D. Snell, Inc., 29 West 15th Street, New York, N.Y., who presented three papers before the Third World Petroleum Congress at The Hague, May 28th to June 6th. The first, co-authored by Lyman H. Allen, Jr., and Robert Sandler, discussed detergency from the chemical engineering viewpoint. The second, prepared with Irving Reich, F.A.I.C., considered the advantages and disadvantages of synthetic detergents. The third, prepared jointly with John R. Skeen, F.A.I.C., treated petroleum-based detergents from a market research standpoint. Reprints of these papers may be obtained on request.

Condensates

Ed. F. Degering, F.A.I.C.

The Miner Laboratories

Taxes, believe it or not, come out of production, and the more we pay out as individuals or corporations for taxes, the less those producing the taxes have left for themselves.

—*Better Living*

Gelsoy, made from the soybean, is a tough-sticking glue which will adhere to tin, glass, and ceramics.

Synthetic pyrethrum, which is an allyl homolog of Cinerin I, is a near, if not exact, duplication of one of the active principles of pyrethrum.

A flame-resistant, non-toxic synthetic wax is obtained by the treatment of tetrachlorophthalic anhydride with a mixture of the monoamylamines.

Fundamental research, according to President Frederick L. Harde of Purdue University, is the goose that lays the golden egg, whereas applied research develops the technic which yields the omelet. If there are no eggs, there is no omelet.

The S.S. *Marine Chemist*, of the Dow Chemical Co., will transport chemicals from Freeport, Texas, to the East Coast.

Curtain and drapery materials, fabricated from acetate rayon or glass fabric, are the most resistant to deterioration by radiator heat or sunlight.

By removal of some of the moisture content of a egg through the use of dehydrating agents and vacuum, according to S. A. Kaloyereas of L.S.U., it is possible to freeze eggs without rupture of the shell.

The only real security a man has in this world is his own intelligence, diligence, and resourcefulness.

—K. W. Miller

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